

machine by which he had done it, telling me that he had thought of it twenty years before. I could easily see by the colour of the ink and paper that it must have been done many years. He then told me, what was very certain, that he had neither stolen the thought from me, nor had I from him; and from that time till his death, Mr. Ellicott was one of my best friends."

The editor of my copy of Ferguson's works, "David Brewster, A.M., 1803," adds that James Ferguson was elected a Fellow of the Royal Society without paying the usual admission fees. This honour he shared with Sir Isaac Newton and Mr. Thomas Simson, the self-taught mathematician. Two Scottish philosophers—David Hume and James Ferguson—died in 1776, both leaving autobiographies of singular beauty and pathos. Our own Huxley, who like James Ferguson was afflicted with "an ineradicable tendency to try to make things clear," has done the same in recent times. Two questions instantly present themselves: (1) On how many distinguished men has this honour been conferred by the Royal Society since these times? and (2), Is there a "watchmaker" now in that learned body? J. HUGHES HEMMING.

Kimbolton, September 24.

A Case of Inherited Instinct.

I THINK the interesting cases mentioned by Captain Hutton on p. 411 will hardly bear the interpretation he puts upon them. In New Mexico three genera of *Stenopelmatus* are common, viz., *Stenopelmatus*, *Centhophilus* and *Udeopsylla*. These locusts are nocturnal, and live under logs or in holes in the ground during the day. It is natural, therefore, that they should be attracted by any dark place, such as a cave. The species of *Centhophilus*, like the crickets, are found in houses, which are well adapted to their tastes. There is no new instinct, or revival of a dormant one, exhibited in this choice. Similarly, in Colorado I have found the species of *Centhophilus* to live in mines, which are practically caves of recent origin.

The cave-seeking instinct, therefore, has been practically continuous, and if in New Zealand one genus (*Pachyrhamma*) lives in caves, while its ally (*Gymnoplectron*) is arboreal, it is probable that the former retains the instincts of their common ancestor, while the latter has lost them, so far as the arboreal habit is concerned.

T. D. A. COCKERELL.

Mesilla Park, New Mexico, U.S.A., September 15.

Maggots in Sheep's Horns.

IN a letter which appeared in your issue of September 29, Captain Traherne writes under the heading of "Horn-feeding Larvæ," of maggots of about half an inch in length and of a white colour, having been found in the horns of a newly killed sheep, which he had obtained in India, but where there were no perceptible signs of perforation. These were not the larvæ of a Lepidopterous insect, but of one of the Diptera, known as *Æstrus ovis*, a well-known parasite. The fly lays her eggs in the region of the anterior nares, and the larvæ penetrate the nasal passage, finding their way into the turbinal bones, and from thence into the frontal cavity to the base of the horns. Captain Traherne does not say how far up the horn he found them; they are not usually found beyond the base, but as a rule locate themselves at the back of the throat, where they feed on the mucous substance. They are not horn-feeders. *Æstrus ovis* is distributed pretty generally wherever sheep are to be found.

Mr. Austen, of the British Museum (Nat. Hist.), showed me some very fine specimens, both of the fly and the larvæ.

W. H. MCCORQUODALE.

"Luminous Clouds," or Aurora?

SURELY the "luminous clouds" reported from Cornwall on September 10, in your issue of September 29, were auroral. It is a pity if no other record of altitude has been made, when one observation of such precision is available. I myself have a fairly good record of the upper edge of the bright arch, low down in the N.W. on the previous evening at 11 p.m., as seen from Croydon. If others have a record of this, a comparison might be of value.

It may be worth noting the very probable recurrence of auroræ on the evenings beginning with the 6th inst., when the solar revolution produces the conditions of the last magnetic

outbreak, so far as the aspect of the sun is concerned. I have been much struck by this recurrence in working up a series of unpublished auroral observations from York, dating back to 1832.

112 Wool Exchange, E.C.,

J. EDMUND CLARK.

September 30.

A Hairless Rat.

I SHOULD like to draw the attention of your readers to a peculiar case which may be worth notice.

About ten days ago a man employed at the Ordnance Store Department, Stonehouse, brought me what he termed a "real curio." It was a rat, adult though not very old, without any hair on its body. It was caught in an ordinary trap at the Victualling Yard, and it is still alive, active and, to all appearance, healthy.

In appearance the rat is of a brownish colour, and with the exception of its whiskers, which are normal, and an occasional long woolly hair on the body, it is quite hairless. When at rest the skin is thrown into numerous small folds or corrugations, and its colour is heightened by the dirt which collects in these folds. In active movement the folds disappear. The tail, except an inch at the base, is normal in appearance, though devoid of hair. The ears appear rather larger than usual, and the eyes are somewhat prominent.

On communicating with the Superintendent of the Zoological Society's Gardens, I was referred to a paper by J. S. Gaskoin, in the *Proceedings* of the Zoological Society for 1856. A precisely similar case is there described, concerning four mice captured at Taplow in 1854. One of these gave birth to five young, shortly after capture, and these resembled the parent in every respect. There is no plate in the copy of the *Proceedings* that I have referred to, and the only difference in the description of the mice which does not fit my specimen is the colour of the ears, which are light coloured.

T. V. HODGSON.

Municipal Museum, Plymouth, September 29.

THE DYNAMICAL THEORY OF REFRACTION, DISPERSION AND ANOMALOUS DISPERSION.¹

THE dynamical theory of dispersion, as originally given by Sellmeier,² consisted in finding the velocity of light as affected by vibratory molecules embedded in ether, such as those which had been suggested by Stokes³ to account for the dark lines of the solar spectrum. Sellmeier's mathematical work was founded on the simplest ideal of a molecular vibrator, which may be taken as a single material particle connected by a massless spring or springs with a rigid lining of a small vesicle in ether. He investigated the propagation of distortional waves, and found the following expression (which I give with slightly altered notation) for the square of the refractive index of light passing through ether studded with a very large number of vibratory molecules in every volume equal to the cube of the wavelength:—

$$\mu^2 = 1 + m \frac{\tau^2}{\tau^2 - \kappa^2} + m_1 \frac{\tau^2}{\tau^2 - \kappa_1^2} + m_{11} \frac{\tau^2}{\tau^2 - \kappa_{11}^2} + \&c.$$

where τ denotes the period of the light; $\kappa, \kappa_1, \kappa_{11}, \&c.$, the vibratory periods of the embedded molecules on the supposition of their sheaths held fixed; and $m, m_1, m_{11}, \&c.$, their masses. He showed that this formula agreed with all that was known in 1872 regarding ordinary dispersion, and that it contained what we cannot doubt is substantially the true dynamical explanation of anomalous dispersions, which had been discovered by Fox-Talbot⁴ for the extraordinary ray in crystals of a chromium salt, by Leroux⁵ for iodine vapour, and by Christiansen⁶ for liquid solution

¹ Abstract of part of the substance of a communication by Lord Kelvin, G.C.V.O., to Section A of British Association at Bristol, on September 9.

² Sellmeier, *Pogg. Ann.*, vol. 145, 1872, pp. 399, 520; vol. 147, 1872, pp. 386, 525.

³ See Kirchhoff-Stokes-Thomson, *Phil. Mag.*, March and July 1860.

⁴ Fox-Talbot, *Proc. Roy. Soc. Edin.*, 1870-71.

⁵ Leroux, *Comptes rendus*, 55, 1862, pp. 126-128.

⁶ Christiansen, *Ann. Phys. Chem.*, 141, 1870, pp. 479, 480; *Phil. Mag.*, 41, 1871, p. 244; *Annales de Chimie*, 25, 1872, pp. 213, 214.

of fuchsin and had been experimentally investigated with great power by Kundt.¹

Sellmeier himself somewhat marred² the physical value of his mathematical work by suggesting a distinction between refractive and absorptive molecules ("refractive und absorptive theilchen"), and by seeming to confine the application of his formula to cases in which the longest of the molecular periods is small in comparison with the period of the light. But the splendid value of his formula for physical science has been quite wonderfully proved by Rubens (who, however, inadvertently quotes³ it as if due to Ketteler). Fourteen years ago Langley⁴ had measured the refractivity of rock-salt for light and radiant heat of wave-lengths (in air or ether) from $\frac{1}{4}$ of a mikron to $5\frac{1}{3}$ mikrons (the mikron being 10^{-6} of a metre, or 10^{-4} of a centimetre), and without measuring refractivities further, had measured wave-lengths as great as 15 mikrons in radiant heat. Within the last six years measurements of refractivity by Rubens, Paschen, and others, agreeing in a practically perfect way with Langley's through his range, have given us very accurate knowledge of the refractivity of rock-salt and of sylvin (chloride of potassium) through the enormous range of from $\frac{1}{4}$ of a mikron to 23 mikrons.

Rubens began by using empirical and partly theoretical formulas which had been suggested by various theoretical and experimental writers, and obtained fairly accurate representations of the refractivities of flint-glass, quartz, flint-spar, sylvin, and rock-salt through ranges of wave-lengths from $\frac{1}{4}$ to nearly 12 mikrons.⁵ Two years later, further experiments extending the measure of refractivities of sylvin and rock-salt to radiant heat of wave-lengths up to 23 mikrons, showed deviations from the best of the previous empirical formulas increasing largely with increasing wave-lengths. Rubens then fell back⁶ on the simple unmodified Sellmeier formula, and found by it a practically perfect expression of the refractivities of those substances from $\frac{1}{4}$ to 22 $\frac{2}{3}$ mikrons.

And now for the splendid and really wonderful confirmation of the dynamical theory. One year later a paper by Rubens and Aschkinass⁷ describes experiments proving that radiant heat after five successive reflections from approximately parallel surfaces of rock-salt and again of sylvin, is of mean wave-length 51 $\frac{1}{2}$ and 61 $\frac{1}{3}$ mikrons respectively. The formula which Rubens had given in February 1897, as deduced solely from refractivities measured for wave-lengths of less than 23 mikrons, made μ^2 negative for radiant heat of wave-lengths from 37 to 55 mikrons in the case of reflection from rock-salt, and of wave-lengths from 45 to 67 mikrons in the case of reflection from sylvin! (μ^2 negative means that waves incident on the substance cannot enter it, but are totally reflected).

should be sent to that institution: it arrived two days later, and its remains are now in my care.

The last specimen of *Notornis* was captured twenty years ago; and it was almost universally considered by Maories, as well as by whites, to be extinct; hence the interest that attaches to the present specimen.

It may not be uninteresting to naturalists at home to be reminded of some facts in the history of *Notornis* as recorded in Buller's "Birds of New Zealand." The name was originally bestowed by Owen on some fossil bones discovered in the North Island, New Zealand.

Some years later (1849), Mr. W. Mantell was able to secure a freshly killed specimen, taken in the south-west of the Middle Island (the southern of the two main islands of New Zealand). This bird, the skin of which is in the British Museum, was declared by competent ornithologists at home to be identical with the fossil form. The second specimen was killed by Maories in 1851, and its remains are also in the National Collection. The third specimen was obtained nearly thirty years later, in 1879, and was purchased for the Dresden Museum. (From an examination of the bones Dr. A. B. Meyer declared it to be distinct from the fossil form, and named it *N. hochstetteri*.) These three specimens were killed at three spots about 100 miles apart, in very rugged country. Later, an incomplete skeleton was discovered, which is at present in the Otago Museum.

The bird recently killed is thus the fourth specimen seen in the flesh, and its future fate is at present uncertain. It was killed by a dog in the bush adjoining Lake Te Anau, in the same district as the other three specimens.

I have examined and made sketches of its viscera, which, like all parts of the bird, are carefully preserved for the owner. The specimen is a young female, in excellent health and splendid plumage.

During the present month I have been fortunate enough to obtain, on deposit, an egg of the Moa—the third or fourth, I believe, in anything like a complete condition. Although the egg is much broken, one side remains practically complete; the pieces of the other side had fallen inwards, and are embedded in the sand within the shell. The egg was discovered in a sandy deposit, and when it reached me was partially enveloped in sand. This has been removed, as far as safety would permit, from the more complete side of the egg, and the whole was thoroughly soaked in weak gelatine to bind sand and shell together. The specimen closely agrees in size and shape with the cast, which is familiar in all museums, and alongside of which it is now on exhibition. As in the case of the eggs previously discovered, it was one of a pair; the other was unfortunately broken, on handling, by those concerned in its excavation.

W. BLAXLAND BENHAM.

Dunedin, August 14.

A FOURTH SPECIMEN OF "*NOTORNIS* MANTELLI," OWEN.

NATURALISTS in New Zealand have this week been thrown into a great state of excitement by the capture of the fourth entire specimen of this very rare flightless Rail.

On August 8 I received a telegram informing me of the acquisition, and asking advice as to its preservation. Fortunately, a skilled taxidermist is attached to the Otago Museum, and I was able to arrange that the bird

¹ Kundt, *Pogg. Ann.*, vols. 142, 143, 144, 145, 1871-72.

² *Pogg. Ann.*, vol. 147, 1872, p. 525.

³ *Wied. Ann.*, vol. 53, 1894, p. 267. In the formula quoted by Rubens from Ketteler, substitute for μ^2 the value of μ found by putting $\tau = \infty$ in Sellmeier's formula, and Ketteler's formula becomes identical with Sellmeier's. Remark that Ketteler's " M " is Sellmeier's " m^2 " according to my notation in the text.

⁴ Langley, *Phil. Mag.*, 1886, 2nd half-year.

⁵ Rubens, *Wied. Ann.*, vols. 53, 54, 1894-95.

⁶ Rubens, *Wied. Ann.*, vol. 60, 1896-97, p. 454.

⁷ Rubens and Aschkinass, *Wied. Ann.*, vol. 64, 1898.

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A LIVING REPRESENTATIVE OF THE OLD GROUND-SLOTHS.

ALL naturalists will unite in congratulating Señor Florentino Ameghino on the remarkable discovery it has been his good fortune to make. It appears that several years ago he was informed by Ramon Lista—a traveller in Patagonia—of an encounter with a strange nocturnal beast, which, after being fired at and apparently hit, succeeded in escaping unharmed. It was described as like an Indian pangolin in size and form, but with the skin covered with greyish red hairs instead of scales; and from the rapidity with which it disappeared among the bushes, seemed to have been an animal of comparatively active habits. Till quite recently, nothing more had ever been heard of the strange creature seen by Lista in Santa Cruz; most of those to whom the story